

Phillips Plastics Corporation®

INTERFACE

Combine Liquid Silicone Rubber
and Your Material of Choice
in a Single Part



Multi-Shot Injection Molding Experts

For more than 25 years, Phillips Plastics Corporation® has designed, engineered, tooled and molded thermoplastic components comprised of two or more resins. This process, known as multi-shot injection molding, has provided reliable results for programs requiring two-, three-, or four-shot molding.

Multi-Shot Liquid Silicone Rubber (MS LSR)

Phillips Plastics has broadened its manufacturing capabilities to include multi-shot liquid silicone rubber (MS LSR) injection molding. This process can combine either two different types of silicone, or silicone and thermoplastic, in one molded part.

Reducing part count with MS LSR has the potential to benefit you with:

- Decreased tooling, assembly, and material costs
- Enhanced design and assembly feasibility
- Increased speed to market

Multiple Over-molding Options, One Supplier

Your design options are limitless with Phillips Plastics. We give you the option to over-mold liquid silicone rubber onto thermoplastic, metal, magnesium, and ceramic materials. For your convenience, we also perform all molding in-house on your behalf. Rather than deal with various suppliers in different geographic locations, you save time working with a single supplier of the services your program requires.

Material Compatibility Testing

Since implementing MS LSR in 2008, we've tested the compatibility of liquid silicone rubber with more than 100 materials. As part of your program, we can run sample plaque molds to test material combinations, silicone adhesion, and heat compatibility prior to tooling. This step helps ensure accurate material formulations are used to achieve overall success of your program.

Typical Thermoplastic Types	Typical Manufacture Name	Anticipated Bond Y/N	Anticipated Heat Compatibility Y/N
ABS	Cyclac/Lustran	Y	Y
Acetal (POM)	Celcon/Delrin	N	N
Acrylic (PMMA)	Acrylite/Plexiglas	Y	N
ASA	Geloy	Y	N
LCP	Vectra	N	Y
Crystalline Nylon	Zytel/Celanese	Y	Y
Amorphous Nylon	Grilamid	Y	Y
Polycarbonate (PC)	Lexan/Makrolon	Y	Y
PC/ABS	Xenoy	Y	Y
PBT	Valox/Celanex/Pocan	Y	Y
PEEK	Victrex	Y	Y
PE	Rexene/Marlex	N	N
PET	Rynite/Ektar	Y	Y
PPD	Noryl	Y	Y
PP	Norchem/Profax/Tenite	N	N
PS	Styron/Lustrex/K-resin	N	N
Polysulfone	Udel/Mindel/Amodel	Y	Y
Polyurethane	Texin/Estane	Y	Y
PVC	Vista/Geon	Y	N
SAN	Tyri/Starax	Y	N

As of 1/15/09	Chemical Bonding Excel/Good/Poor/None	Failure Type Adhesive/Cohesive	Heat Compatibility No Affect/Part Specific/Too Low
Lexan 121-111PW Clear	Good	Adhesive	Part Specific
Makrolon 2405-1000 Clear	Good	Adhesive	Part Specific
Lexan 141 Trans White	Good	Adhesive	Part Specific
Xenoy 5220U Yellow	Excel	Cohesive	Part Specific
Cycloy MC1300	Poor	Adhesive	Too Low
Diamond ABS 7401 Natural	None	NR	Too Low
Crastin SK602 White 15% Glass	Excel	Cohesive	No Affect
Crastin ST820 White	Excel	Cohesive	Part Specific
Valox V3901WX GY80301 Light Grey	Excel	Cohesive	Part Specific
Celanex 3300 Natural	Excel	Cohesive	No Affect
Celanex 2002 Natural	Excel	Cohesive	Part Specific
Zytel 101 Natural	Good	Cohesive	Part Specific
Noryl GFN2 Black	Excel	Cohesive	No Affect
Fortron 114DL4 Natural	None	Adhesive	No Affect
Vectra A130 Natural	Good	Adhesive	No Affect
Amodel AS-1133 Black	Poor	Adhesive	No Affect
Amodel ET-1000 Natural	Poor	Adhesive	No Affect
Grilamid TR9D Natural	Excel	Cohesive	No Affect
Grilamid TR6D Clear	Excel	Cohesive	No Affect
Terblend N NM-11 White	Good	Adhesive	Part Specific
Zytel 103HSL Natural	Good	Cohesive	Part Specific
Zytel 8018HS Natural	Good	Cohesive	No Affect
Zytel 330 NCD10 Natural	Good	Adhesive	Part Specific
Radel R Gray	Excel	Cohesive	No Affect
Udel P1700 Clear	Excel	Cohesive	No Affect
Grilamid Grivory GV-4H	Excel	Cohesive	No Affect
Noryl HNA055 Gray	Excel	Cohesive	No Affect
Lexan HPS1 Natural	Good	Cohesive	Part Specific

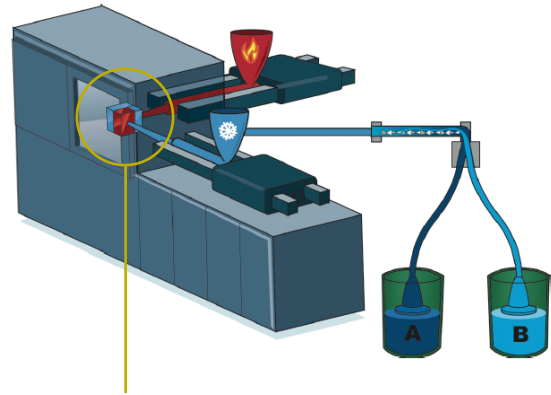
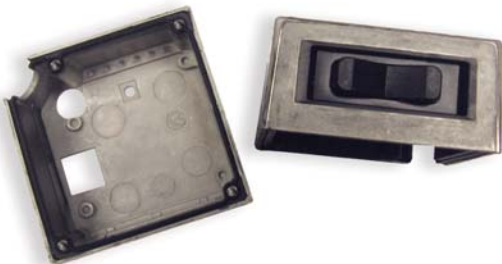
Multi-Shot Liquid Silicone Rubber Advantages

MS LSR brings together the advantages of multi-shot thermoplastic molding with the properties of silicone to produce a versatile, soft-feel part with:

- FDA biocompatibility
- Chemical and bacteria resistance
- Excellent light transmittance and illumination
- Gas permeability
- Clarity
- High tensile strength
- Superior dielectric and insulation traits
- Resistance to deformation under pressure

In addition, liquid silicone rubber is easy to color, able to resist temperatures of 180° C or 365° F or higher, and moldable under tight tolerances. You'll find that the MS LSR process is an easy way to cost-effectively:

- Add product features
- Open numerous new design options that are aesthetically appealing, functional, durable, and economical
- Eliminate assembly, or enable assembly that would not otherwise be possible
- Reduce LSR material usage
- Create new, never-before-imagined designs



The MS LSR Process

Thermoplastic material is fed into a heated barrel and injected into a cold mold. Silicone is metered in a 1:1 ratio for the A and B components through a static mixing system. Then, via a water-cooled barrel, the material is injected into the hot section of the mold. The part is transferred via rotation of mold or mold components between shots of thermoplastic and silicone. Key to the process is the mold (circled above), which is uniquely designed to allow both thermoplastic and thermoset molding in one operation.

Industries Ideally Suited for MS LSR

Medical Device

Infant Care

Electrical

Automotive

Military/Defense

Aerospace/Aviation

Industrial

Consumer Products

Personal Protection

Made In The U.S.A.

Phillips Plastics is one of the few companies in North America to offer MS LSR capabilities, with an extensive 25 years of experience in the multi-shot molding process. From our dedicated manufacturing site in Eau Claire, Wisconsin, our team can handle a wide range of volumes for a variety of markets according to your specific program requirements. Throughout our partnership, we uphold our commitment to delivering service excellence and high-quality outcomes.

